

AGN feedback from Jet-ISM/IGM interactions

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Abstract. We study the propagation of relativistic jets originating from AGNs within the Interstellar/Intergalactic Medium of their host galaxies, and use it to build a model for the suppression of stellar formation within the expanding cocoon.

Keywords. galaxies: jets, galaxies: bulges, galaxies: ISM

1. Jet and surrounding cocoon

Relativistic jets from Supermassive Black Holes hosted within the bulges of spirals and nuclei of early-type galaxies inject significant amounts of energy into the medium within which they propagate, creating an extended, underdense and hot cocoon. We have performed a series of simulations of these jets and cocoons using an AMR code, FLASH 2.5: a typical output is shown in fig. 1.

We find that a slight modification of the exact models of Falle(1991) and Kaiser & Alexander(1997), approximates well the simulations.

2. A model for negative AGN feedback

We can use the exact solutions to develop a model of *negative feedback* of the AGN on the host galaxy. Within the cocoon star formation is strongly suppressed, and at any time we know the extent of the region occupied by the cocoon (fig. 2, *left*). We show in fig. 2 (*right*) the results of this model for AGN feedback. The rapid decrease of stellar formation is a consequence of the high ISM density in the central regions, which are the first to be efficiently depleted by the jet.

A more detailed analysis will be presented in a subsequent paper (Antonuccio-Delogu & Silk, submitted)

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References

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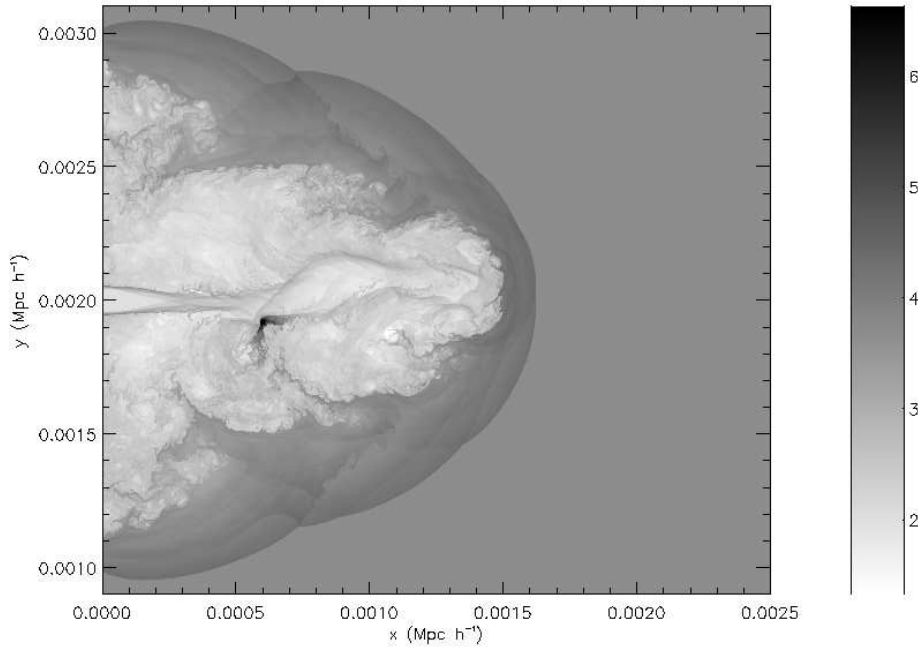


Figure 1. Expansion of the cocoon within the ISM. The jet has an input mechanical power $P_{jet} = 10^{46} \text{ ergs} \cdot \text{cm}^{-3} \cdot \text{sec}^{-1}$, and the ISM density is: $n_e^{ism} = 1 \text{ cm}^{-3}$.

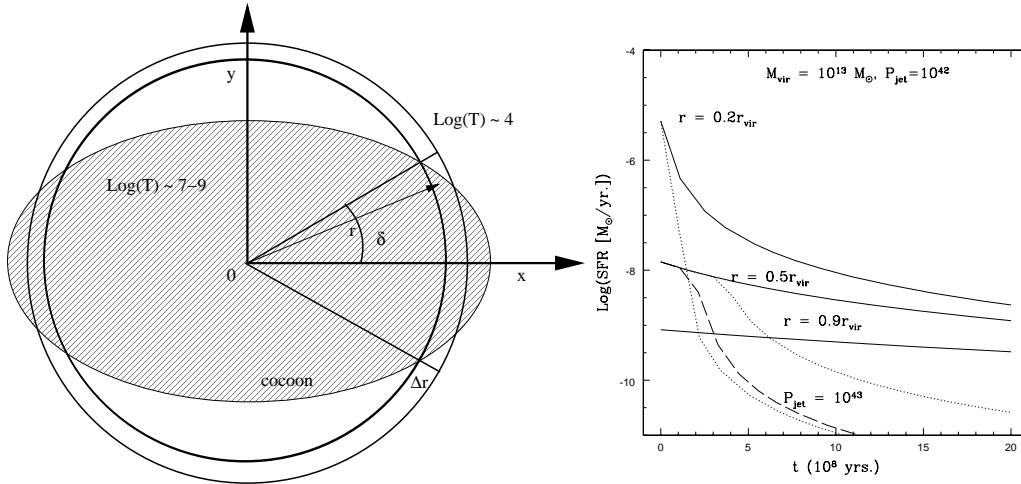


Figure 2. (Left: Model for AGN feedback. The shaded ellipsoidal region is the expanding cocoon. Stellar formation is suppressed within that region of spherical shell of radius r which intersects the cocoon. Right: Suppression of the SFR, for a $M=10^{11} M_{\odot}$ host halo.